WHAT IS CLAIMED IS:

1. An *in-vivo* plasmapheresis and/or *in-vivo* ultrafiltration membrane comprising:

a plurality of elongated hollow fibers each fiber having an outer wall, an inner wall and an interior lumen extending along the length thereof, and wherein the fiber wall structure is a continuous change in mass density from said outer wall to said inner wall and comprises a continuum of voids bounded by solid frames, said fiber wall having a plurality of zones between inner and outer wall surfaces, each of said zones having a mass density different than the mass density of an adjacent zone, said fiber wall having a lower mass density zone at the inner wall surface and a higher mass density zone at the outer wall surface, said fibers capable of separating blood plasma and toxins from whole blood within a blood vessel by passing the plasma and toxins through said fiber wall from the outer wall surface to the interior lumen.

2. A membrane of Claim 1 wherein said membrane fiber wall has two mass density zones.

3. A membrane of Claim 1 wherein said membrane fiber wall has three mass density zones.

4. A membrane of Claim 1 wherein membrane fiber wall has four or more mass density zones.

5. A membrane of Claim 1, 2, 3 or 4 wherein each of said zones is characterized by a different average nominal pore size.

6. A membrane of Claim 5 wherein said lower mass density zone is characterized by a nominal average pore diameter of between about 1 μm and about 60 μm.

7. A membrane of Claim 5 wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3 μm and about 1 μm.

8. A membrane of Claim 6 wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3 μm and about 1 μm.

9. A membrane of Claim 1 characterized by having the capability of extracting at least 0.75 ml/min/cm^2/mm Hg of blood plasma at trans-membrane pressures of between about 5 mm Hg and about 20 mm Hg.

10. A membrane of Claim 5 wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.005 μm and about 0.05 μm.

11. A membrane of Claim 1, 2, 3 or 4 comprising a polysulfone fiber.

12. A membrane of Claim 11 wherein said polysulfone includes a copolymer of polyethylene oxide and polyethylene glycol.

13. A membrane of Claim 11 wherein said polysulfone fiber is produced in the presence of a composition comprising polyvinyl pyrrolidone, N-methyl pyrrolidone, dimethyl acetomide or dimethyl sulfoxide, or mixtures of two or more thereof.

14. A membrane of Claim 13 wherein said polysulfone includes a copolymer of polyethylene oxide and polyethylene glycol.

15. An *in-vivo* plasmapheresis or *in-vivo* ultrafiltration membrane comprising a plurality of elongated hollow fibers each fiber having an outer wall, an inner wall and an interior lumen extending along the length thereof and defined by an inner wall surface and wherein the fiber wall structure is a continuous change in mass density from said outer wall to said inner wall and comprises a continuum of voids bounded by solid frames, said fiber wall having an asymmetrical pore size and asymmetrical mass density between said inner wall surface and the outer wall surface said fiber wall having a higher mass density adjacent to the outer wall and a lower mass density adjacent to said inner wall, said fibers capable of separating blood plasma and toxins from whole blood within a blood vessel by passing the plasma and toxins through said fiber wall from the outer wall surface to the interior lumen.

16. A membrane of Claim 15 wherein the higher mass density fiber wall is characterized by pores having a smaller average nominal pore size as compared to the average nominal pore size in the lower mass density fiber wall.

17. A membrane of Claim 16 wherein said lower mass density is characterized by a nominal average pore diameter of between about 1 μm and about 60 μm.

18. A membrane of Claim 16 or 17 wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.3 μm and about 1 μm.

19. A membrane of Claim 16 wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.005 μm and about 0.05 μm.

20. A membrane of Claim 19 wherein said lower mass density is characterized by a nominal average pore diameter of between about 1 μm and about 60 μm.

21. A assembly of Claim 1 or 15 including a catheter in direct fluid communication with said interior lumen of said fiber.

22. A assembly of Claim 21 comprising a multiple lumen catheter.

23. A membrane of Claim 6 or 17 having a plasma trans-membrane flux of between about 0.5 and about 9 ml/min/cm^2 @ 10 mm Hg.

24. A membrane of Claim 1 or 15 wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.7 μm and about 0.8 μm.

25. A membrane of Claim 24 wherein said lower mass density is characterized by a nominal average pore diameter of between about 5 μm and about 40 μm.

26. A membrane of Claim 25 having a plasma trans-membrane flux of between about 0.75 and about 4 ml/min/cm^2/@10 mm Hg.

27. A membrane of Claim 1 or 15 wherein said higher mass density is characterized by a nominal average pore diameter of between about 0.01 μm and about 0.03 μm.

28. A membrane of Claim 27 wherein said lower mass density is characterized by a nominal average pore diameter of between about 5 μm and about 40 μm.

29. A membrane of Claim 28 having a trans-membrane flux (H_2O) of between about 0.75 and about 4 ml/min/cm^2/@10 mm Hg.

30. A membrane of Claim 15 comprising a polysulfone fiber.

31. A membrane of Claim 30 wherein said polysulfone includes a copolymer of polyethylene oxide and polyethylene glycol.

32. A membrane of Claim 31 wherein said polysulfone fiber is produced in the presence of a composition comprising polyvinyl pyrrolidone, N-methyl pyrrolidone, dimethyl acetomide or dimethyl sulfoxide, or mixtures of two or more thereof.